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EXAMINER

ZERVIGON, RUDY

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/791,030

Applicant(s)

LIU ET AL.

Examiner

Rudy Zervigon

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 September 2008.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 56-70 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 56-70 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 01 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-8508)
Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 56, 57, 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamilton; Todd A. (US 5993555 A) in view of Shealy; J. Richard (US 6217937 B1). Hamilton teaches a reaction chamber (112; Figure 4) including a first flow pathway (along 136+128; Figure 4) and first flow limiting conductance (136), second flow pathway (along 132+128; Figure 4) and second flow limiting conductance (132), third flow pathway (along 142+122; Figure 4) and third flow limiting conductance (142), fourth flow pathway (along 144+124; Figure 4) and fourth flow limiting conductance (144). Further, claims 56, 57, 59-70 have numerous intended use recitations bracketing Applicant's structural elements generally directed to relative line pressures, relative flow rates, relative "switching"/"selecting" configurations, "expose period", and "the first and second flow pathways controlled^L so as to switch the first and third conductances and the second and fourth conductances". All of such claim limitations are deemed intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is configured of performing the intended use, then it meets

¹ No per se "controller" is recited, as such the Examiner believes such control can be interpreted as operator actions.

the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

Hamilton does not teach:

- i. a second gas flow pathway coupled downstream of the reaction chamber (112; Figure 4)
– claim 56

Shealy teaches a similar wafer processing apparatus (All Figures; column 1; lines 4-10) including dynamically controlled (entry MFCs and exhaust MFCs) gas injection (Figure 2) and exhaustion (Figure 3) as well as *multiple* gas flow paths (Figure 3) coupled downstream of the reaction chamber (44; Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to duplicate Hamilton's first gas flow pathway (outlet, not numbered; Figure 4) coupled downstream of the reaction chamber (112; Figure 4).

Motivation to duplicate Hamilton's first gas flow pathway (outlet, not numbered; Figure 4) coupled downstream of the reaction chamber (112; Figure 4) is to ensure equal laminar flow in the processing chamber as taught by Shealy (column 8; lines 1-6).

Further, it is well established that the duplication of parts is obvious (In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04).

3. Claims 62-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamilton; Todd A. (US 5993555 A) and Sakai; Hiroyuki et al. (US 5070813 A) in view of Kugimiya; Katsuhisa et al. (US 6277763 B1).

Hamilton is discussed above.

Hamilton further teaches wherein the gas flow pathway comprises multiple gas flow pathways for purge gasses and chemical precursors which share one or more common inputs to the reactor chamber (112; Figure 4), as claimed by claim 69

Hamilton does not teach:

- ii. An atomic layer deposition (ALD) system, comprising: a gas flow pathway coupled upstream of Hamilton's reactor chamber (112; Figure 4) through selectable Hamilton's upstream flow limiting conductances (132,134,136,142,144; Figure 4) having two or more operational modes including a low flow mode and a high flow mode; and a pumping arrangement coupled downstream of the reactor chamber (112; Figure 4) through selectable downstream flow limiting conductances having two or more operational modes including a low flow mode and a high flow mode - claim 62. Applicant's claim limitations of "An atomic layer deposition (ALD) system:", "having two or more operational modes including a low flow mode and a high flow mode", and "configured to switch operational modes in time-phase with one another" are each claim requirements of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

- iii. The ALD apparatus of claim 62, wherein the Hamilton's upstream flow limiting conductances (132,134,136,142,144; Figure 4) are configured to switch operational modes prior to the downstream flow limiting conductances switching operational modes, as claimed by claim 63
- iv. The ALD apparatus of claim 62, wherein the downstream flow limiting conductances include a throttle valve, as claimed by claim 64
- v. The ALD apparatus of claim 64, wherein the throttle valve comprises an annular throttle valve located within the reactor chamber (112; Figure 4), as claimed by claim 65.
- vi. The ALD apparatus of claim 65, wherein the annular throttle valve includes multiple vanes, each having an axis therethrough, as claimed by claim 66
- vii. The ALD apparatus of claim 65, wherein the annular throttle valve includes multiple blades arranged in an iris configuration, as claimed by claim 67
- viii. The ALD apparatus of claim 65, wherein the annular throttle valve includes multiple blades, each having a number of holes therethrough, at least one of the blades being rotatable about an axis such that holes extending through the rotatable blade align with holes of at least one of the other blades to provide a passage through the annular throttle valve, as claimed by claim 68
- ix. The ALD apparatus of claim 62, wherein the Hamilton's upstream flow limiting conductances (132,134,136,142,144; Figure 4) and downstream flow limiting conductances are configured to switch operations modes according to a difference in residence times for passage of gas between (i) the upstream conductances and the

reaction chamber, and (ii) the reaction chamber and the downstream conductances, as claimed by claim 70

Sakai teaches a wafer treating apparatus (Figure 1) including reaction chamber (1; Figure 1).

Sakai further teaches:

- i. a pumping (8; Figure 1, column 2; lines 45-69) arrangement coupled downstream of the reactor chamber (1; Figure 1, column 2; lines 45-69) through selectable downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) having two or more operational modes including a low flow mode and a high flow mode, wherein software control (20; Figure 1) is configured to switch operational modes of Sakai's downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69), downstream conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) being under software control (20; Figure 1) - claim 62. Applicant's claim limitations of "An atomic layer deposition (ALD) system:", "having two or more operational modes including a low flow mode and a high flow mode", and "configured to switch operational modes in time-phase with one another" are each claim requirements of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re

Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

- ii. switch operational modes prior to the downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) switching operational modes, as claimed by claim 63. Applicant's claim limitations of "are configured to switch operational modes prior" is a claim requirement of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).
- iii. the downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) include a throttle valve (9; Figure 1, column 2; lines 45-69,2), as claimed by claim 64
- iv. the throttle valve (9; Figure 1, column 2; lines 45-69,2) comprises an annular throttle valve (9; Figure 1, column 2; lines 45-69,2) located within the reactor chamber (1; Figure 1, column 2; lines 45-69), as claimed by claim 65.
- v. the annular throttle valve (9; Figure 1, column 2; lines 45-69,2) includes multiple vanes (10; Figure 2; column 3; lines 1-29), each having an axis therethrough, as claimed by claim 66

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- vi. the annular throttle valve (9; Figure 1, column 2; lines 45-69,2) includes multiple blades (10; Figure 2; column 3; lines 1-29) arranged in an iris configuration, as claimed by claim 67
- vii. the annular throttle valve (9; Figure 1, column 2; lines 45-69,2) includes multiple blades (10; Figure 2; column 3; lines 1-29), each having a number of holes (a,b; Figure 2; column 3; lines 1-29) therethrough, at least one of the blades (10; Figure 2; column 3; lines 1-29) being rotatable about an axis such that holes (a,b; Figure 2; column 3; lines 1-29) extending through the rotatable blade align with holes (a,b; Figure 2; column 3; lines 1-29) of at least one of the other blades (10; Figure 2; column 3; lines 1-29) to provide a passage through the annular throttle valve (9; Figure 1, column 2; lines 45-69,2), as claimed by claim 68
- viii. Sakai's downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) is configured to switch operations modes according to a difference in residence times for passage of gas between (i) the upstream conductances and the reaction chamber, and (ii) the reaction chamber and the downstream conductances, as claimed by claim 70. Applicant's claim limitation "configured to switch operations modes according to a difference in residence times for passage of gas between (i) the upstream conductances and the reaction chamber, and (ii) the reaction chamber and the downstream conductances" is a claim limitation of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use

must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

Hamilton and Sakai do not teach wherein Hamilton's selectable upstream conductances (132, 134, 136, 142, 144; Figure 4) and Sakai's selectable downstream conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) being under software control to switch operational modes in time-phase with one another - claim 62.

Kugimiya teaches selectable upstream conductances (126; Figure 1) and Kugimiya's selectable downstream conductance (136; Figure 1) being under software control (202; column 3; lines 55-60) to switch operational modes with one another (column 3; lines 43-60) - claim 62.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add plural Sakai's downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) and pumping arrangement (8, 20; Figure 1, column 2; lines 45-69) to Hamilton's apparatus. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to automate the apparatus of Hamilton and Sakai as taught by Kugimiya.

Motivation to add plural Sakai's downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) and pumping arrangement (8, 20; Figure 1, column 2; lines 45-69) to Hamilton's apparatus is for accurate exhaust flow control as taught by Sakai (column 1, lines 53-64). Further, it is well established that the duplication of parts is obvious (In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04).

Motivation to automate the apparatus of Hamilton and Sakai as taught by Kugimiya is for facilitating process control as taught by Kugimiya (column 3, lines 44-45).

4. Claim 58 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamilton; Todd A. (US 5993555 A) and Shealy; J. Richard (US 6217937 B1) and further in view of Cox; Gerald M. (US 6228773 B1). Hamilton and Sakai are discussed above. Hamilton and Sakai do not teach a plasma assisted process. Cox teaches a similar processing apparatus arrangement in Figure 14, including external plasma sources 4.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Cox's plasma source to Hamilton's apparatus.

Motivation to add Cox's plasma source to Hamilton's apparatus is for providing "plasma treatment" to wafers as taught by Cox (claim 25).

Response to Arguments

5. Applicant's arguments with respect to claims 56-70 have been considered but are moot in view of the new grounds of rejection.

Conclusion

6. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Friday schedule from 9am through 5pm. The official fax phone number for the 1792 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435

/Rudy Zervigon/

Primary Examiner, Art Unit 1792